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NOTICES OF The Aëronautical Society.

GENERAL MEETING.

The concluding General Meeting of the Session of the Aëronautical Society of Great Britain will take place on Thursday, July 17th, at the Society of Arts, John Street, Adelphi, at 8 p.m., Major H. C. ROBERTS in the chair.

On this occasion the Brazilian Minister, accompanied by the staff of the Brazilian Legation, will honour the Society by his presence.

The following Papers will be read:—

"The 'Peace' Balloon of the late Senhor Augusto Severo."

1. By Dr. Carlos Sampaio.
2. By Mr. Eric Stuart Bruce, M.A. (with lantern illustrations and experiments).

A vote of condolence with the Brazilian Nation on the lamented death of the late Senhor Augusto Severo will be proposed from the Chair.

The Brazilian Minister will reply.

"Balloon Ascents in Thunderstorms," by the Rev. J. M. Bacon (with lantern illustrations).

Note on "A Performance of the Bristol War Balloon during the South African War," by Captain H. B. Jones, R.E.

Note on "The Cycala Flying Machine," by Dr. Charles Zimmerman.

INTERNATIONAL KITE COMPETITION.

There will be an International Competition for the Highest Kite Flight under the auspices of the Aëronautical Society of Great Britain, in 1903. Further particulars will be shortly announced.

ERIC STUART BRUCE,

Honorary Secretary.

Aëronautics and Peace.

The announcement of the establishment of Peace has been received with exultation by every scientific society in Great Britain, but it may with reason be said that in the reception of the welcome news aëronauts had a joy peculiarly their own in the knowledge that the balloon has played so prominent a part in the attainment of conquest and peace. The successful operations of the military balloonists in South Africa have from time to time been chronicled in the pages of this Journal. The graphic account of the exploits of the aëronauts in critical situations given by Colonel Templer last July, in reply to a question asked at a meeting of the Aëronautical Society, made the members fully aware of the competency to which our national balloon equipment has attained. The services of the balloonists were further noted in a lecture given before the Society of Arts last February by the Honorary Secretary of the Aëronautical Society. Still further confirmation of the usefulness of the balloon in the South African war will be forthcoming at the next meeting of the Aëronautical Society in a note by Captain H. B. Jones.

The news of Peace has brought to the members of the Aëronautical Society the pleasant expectation of the return of the President of the Society, who throughout the whole of the campaign has been unceasingly at work, and has of late been occupying the post of President of the Compensation Board.

Just as we are going to press the news has come to hand that Major B. T. S. Baden-Powell left Cape Town for England on board the *Tagus* on June 30.

The Fatal Accident to "Le Paix."

The tragic fate of Senhor Augusto Severo and M. Georges Saché and the total destruction of the navigable balloon, "Le Paix," in Paris, on May 11th, have caused universal consternation, all the more vivid, on account of the interest in airships awakened by the experiments of M. Santos Dumont. As will be seen by announcements in another part of this journal, the subject of the Severo navigable balloon will form a substantial part of the programme of the next meeting of the Aëronautical Society on July 17th, when the Brazilian Minister, accompanied by the staff of the Brazilian Legation, will honour the Society by his presence. We will, therefore, refrain from further comment on the lamented death of the ingenious Brazilian politician in the present issue of the journal, since the proceedings of the forthcoming meeting will be duly chronicled in the October number. An illustration of the Severo airship is, however, appended. It will be noticed that in the picture the motors are not shown, so that the symetrical outlines of the novel combination of balloon and car in one body may be the more manifest.

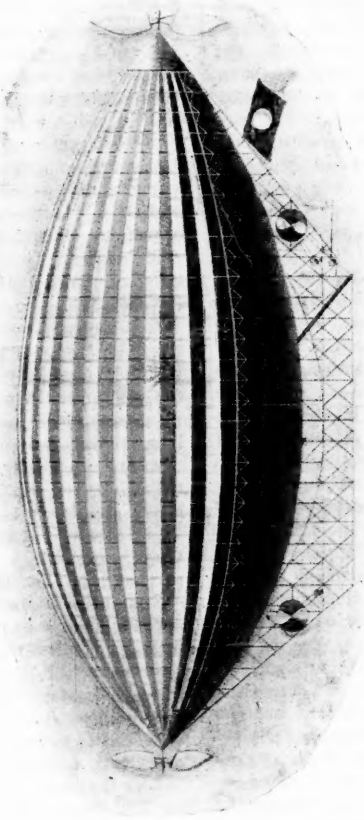
Recent Lectures on Aëronautical Subjects.

1.—SCIENTIFIC OBSERVATIONS AT HIGH ALTITUDES.

By the Rev. J. M. Bacon.

There could be no more striking example of the growth of interest in Aëronautical matters, than the fact that that eminently practical Society, the Society of Arts during last session devoted two Wednesday evenings to papers on aëronautical subjects, the first on scientific observations at high altitudes, being delivered on January 22nd, by the Rev. J. M. Bacon, the second on "The Use of Balloons in War," on February 21st, by Mr. Eric Stuart Bruce.

At the commencement of Mr. Bacon's paper he gave some of his experiences as to the varying directions of aërial currents at differ-



The "Peace" Balloon of Senhor Augusto Severo.

ent altitudes, experiences which show how dependent the aëronaut is upon sight of the earth for an estimation of the direction of the course of the balloon. On one occasion, starting from the Crystal Palace, with only a light air, the aëronauts entered mist at less than twice the height of the North Tower, at which point they determined their course as lying over the body of the Palace and on into the west. Then the balloon mounted rapidly to some 4,000 feet, and was cut off from all view of earth by a "tossing sunlit cloud-floor." When the balloon descended two hours later, it was thought that a landing would be effected in Hampshire or Berkshire, but contrary to all expectation, the aëronauts found themselves over the sea at the mouth of the Thames, for the balloon had been headed back by a fast upper current in the opposite direction to the current near the ground. On the occasion of an ascent from Newbury, when the balloon had got out of control, the aëronauts drifted for 10 hours at a height between 4,000 and 7,000 feet above a universal cloud stratum. The descent was made at Neath, Glamorganshire, where the wind was blowing half a gale. It was estimated that in its voyage the balloon was either blown out to sea and brought back again by an opposite current, or else for the first sixty miles the wind at the altitude at which the balloon was travelling was blowing at a rate of less than eight miles an hour.

The existence of currents travelling in different directions at different altitudes naturally suggests their utilization for the purposes of aërial navigation. Mr. Bacon appears to have made at least one successful attempt at their utilization. "It was on a still August afternoon that the intelligent following up of two diverse currents resulted in our steering our balloon, which I had equipped for signalling purposes, with a 'collapsing drum' across the entire stretch of Salisbury Plain, so that almost beyond my hopes I passed immediately over the military camps on the Plain and exchanged signals with them." It is to be regretted that Mr. Bacon did not furnish the exact details of this interesting manœuvre, as examples of steering a balloon's course by the use of diverse currents are very scarce. Speaking further on the subject of the horizontal currents, Mr. Bacon says "not unfrequently it is possible to determine that the course of horizontal air currents even up to a considerable height are being influenced by the nature or conformation of the surface of the earth immediately beneath. I have, for example, met with numerous windings of an estuary or river valley, and on one occasion, at a height of a thousand feet over Kent, it was impossible to resist the conviction that we were for some miles strictly following a chalk ridge."

An interesting observation, and one that suggests further research, is the uncertain courses of minor air streams of air. While the balloon was being carried with the more sluggish current a number of small parachutes were dropped at frequent intervals and carefully watched. These would commonly attend the balloon for a little while, until getting into some minor air streams, they would suddenly and rapidly diverge at such wide angles as to suggest that crossing the actual course of the balloon there were side paths down which the smaller bodies were wafted.

Mr. Bacon suggests that some of the caprices of temperature experienced in balloon voyages are caused by the more slender currents. Comparatively high temperatures are of not unfrequent occurence at considerable heights. These may be due to warmer wandering rills, Here, again, is scope for definite research.

It is suggested that haze is largely due to the commingling of air streams. "These must surely favour the formation of water dust in the atmosphere. We see evidence of this on the mountain sides; again, in those belts of mist lying across open country where opposing air currents meet and mingle; possibly, too, in the murky veil which gathers about a thunder cloud, and due, presumably, to the conflict of those contrary currents of widely differing temperature, which have been held to be in part, at least, the cause of such storms."

Some observations made as to the presence of dust in the atmosphere are not without interest. It is somewhat surprising to hear that on a still May afternoon, at 2,000 feet above Kingston, the air was found more heavily charged with dust than was the case with the air of the London streets the next day. But, perhaps, it is still more surprising to hear that the purest sample of air collected by Mr. Bacon, was at the open end of the Aldersgate platform of the Metropolitan Railway! Another example of the height to which dust penetrates was afforded in August last, when, at half a mile above the city, the dust, though somewhat less in quantity, was far more abundant than on the ground within the enclosure of Stamford Bridge in the forenoon of the following day.

Some interesting facts concerning Mr. Bacon's acoustical experiments from balloons

are recorded in his paper. On August 13th last, two gun-cotton charges were fired over London from a balloon, one over Soho Square at an altitude of 2,000 feet, the other four minutes later over Grays Inn Road. The balloon was travelling with a gentle breeze from the South-West, and at the altitude attained the air had grown more humid with an accession of moisture that declared itself in copious rain the next day. It was observed that "(1), in the case of each report the number of observations recorded against the wind greatly exceeded those recorded up or down the wind; (2), the longer sound ranges were chiefly in directions lying athwart the balloon's course; (3), certain quarters, neither particularly near, nor particularly quiet, would seem to have been accessible to the sound waves as by some special channel."

Mr. Bacon thinks that in certain conditions of atmosphere there are aërial sound channels through which sounds are momentarily conveyed with abnormal intensity. "A remarkable instance of the casual passage of sound was afforded as day broke, in one of the voyages already referred to. It was over the quiet pastures of Kent, with no sounds in the air save the first awakening of bird life. Suddenly, and for a brief second only, voices engaged in conversation whispered (I can use no other expression) in our ears, yet we were a quarter of a mile in the sky, and the speakers were not within view."

2.—THE USE OF BALLOONS IN WAR

By Eric Stuart Bruce, M.A.

At the commencement of the lecture, Mr. Bruce said that the object which stimulated the practical invention of the balloon was its use in war. He said practical invention, because in theory the balloon dates back as far as the elucidation of the principle of the pressure of fluids by Archimedes of Syracuse. But it was its use in war which fired Montgolfier, the paper-maker of Annonay in 1773, to fill his paper bags with heated air, and Charles, the Parisian, in the same year, to eclipse the fame of the former by the invention of the gas balloon. Ten years after the experiments of Montgolfier and Charles, balloons were first used by the French Government. It was Guyton de Merveau who first suggested their use to the Committee of Public Safety; and the first experiments were so successful that a regular company was formed called "Aerostiers," and the School of Ballooning, established at Meudon. The first military balloon made was called the "Entrepenant." This was used at the Siege of Maubenge and Charleroi, also at the battle of Fleurus. On this latter occasion it is recorded that the balloon remained in the air 10 consecutive hours, every movement of the enemy being seen and signalled. It was again used at the Seige of Mainz. In 1796 the French Government manufactured some more war balloons, which were sent to the armies of Dusseldorf and Stuttgardt. Altogether, it would seem that better work with captive balloons in war was done at that early period than during the whole time which elapsed between those wars and the South African campaign, in which the use of the balloon was so conspicuous.

Concerning the question of the chance of a balloon being struck by the enemy's fire; to illustrate that, a balloon may be perforated with bullets in its lower part, and yet remain in the air owing to the upward pressure of the hydrogen gas; the lecturer perforated a small captive balloon over and over again in its lower part with a steel needle, and yet the balloon remained in the air throughout the evening. It was mentioned that many of the balloons at Aldershot which had been at the seat of war showed signs of the bullet perforation. Several facts showing the usefulness of the observation balloons in the recent war were then quoted, stress being laid on the discovery made from the balloon that the British troops were about to march into a death trap at Spion Kop. Concerning that observation, Mr. Bruce said, "on reflecting on the narrow escape of a great disaster averted by the balloons at Spion Kop, the thought forces itself upon the mind what would have happened had it not been for that happy aërial observation at that critical moment? What might have been the effect of depression on our army and exhilaration on the part of the Boers? I will not go so far as to hint that Ladysmith might have fallen, for the history of the sieges of Ladysmith and Mafeking show how difficult it is to find the limit of British endurance; but I will say that this brilliant achievement of the balloonists facilitated the relief of the hard-pressed garrison." Concerning the use of the balloon at Fourteen Streams, where it worked continuously for fourteen days with one inflation; it was pointed out that this was the best possible test of the efficiency of the retentive power of gold-beater's skin. "Much is said at the pre-

sent moment about the backwardness of the British nation in aëronautical matters. In answer to such statements, I would express my opinion that at the present moment, no other nation in the world could have produced a balloon of the same size that would have thus worked for thirteen days with one load of gas."

Speaking of the utility of a free balloon in war, the lecturer urged that its usefulness would be largely increased if it could be steered against a wind of considerable power. "Aërial warfare in navigable balloons is the prophecy of the past. Tennyson has written of 'the nation's airy navies grappling in the central blue.' But science, as yet, has not produced a navigable balloon capable of fulfilling this vision of fancy, and even if it had, it is probable that our international convention would prohibit the discharge of explosives from aërial vessels, 'The rain of ghastly dew' as being too barbarous even for modern warfare. Though I do not wish to speak in defence of such a system of warfare, yet I would ask whether torpedo warfare, which is generally accepted, is not equally uncivilised. But if never used as a floating battery, a balloon that could navigate the air against even a moderate breeze would be a great advantage to an army for scouting purposes."

The various experiments with navigable balloons, from the steam balloon of Giffard to the petroleum motor balloon of M. Santos Dumont, were then described and illustrated by lantern slides. With regard to the wind forces overcome by M. Santos Dumont, it was stated that when these were examined they amounted to about $4\frac{1}{2}$ to 5 metres a second, an advance of a metre and a half per second on the experiments of Captains Krebs and Renard in 1885. It was pointed out that the latter had only 9 horse-power, whereas the former had 20 horse-power.

"With present knowledge a balloon can be steered in calm weather, but the question how to navigate it in any wind is absolutely unsolved. This working model shows you the principle of a navigable balloon. In the calm air of this room, by means of its rudder and screw, we can navigate it where we wish. To further the solution of the problem of a navigable balloon, capable of being useful in war, careful quantitative experiments will be more useful than any number of the more sensational journeys under the conditions of money prizes, in which the scientific desiderata are not sufficiently taken into account. When I say this, I do not belittle the work of such heroes of aerial navigation as M. Santos Dumont. By his bravery and perseverance he has winged the petroleum motor, and shown possibilities for the future. But in the future the problem must be more seriously attacked than for the purposes of sport. The time has arrived for the Endowment of Aëronautical Research. In conclusion, may I express the hope that before long the British nation will apply to aëronautics some of its engineering skill, and launch into the air a navigable balloon which will be able to overcome a sufficiently strong wind to add to the resources of our national defences." (Applause.)

The Mellin Airship.

We are indebted to the courtesy of Messrs. C. G. Spencer and Sons for the following details of the Mellin Airship, which has been designed and constructed by that firm.

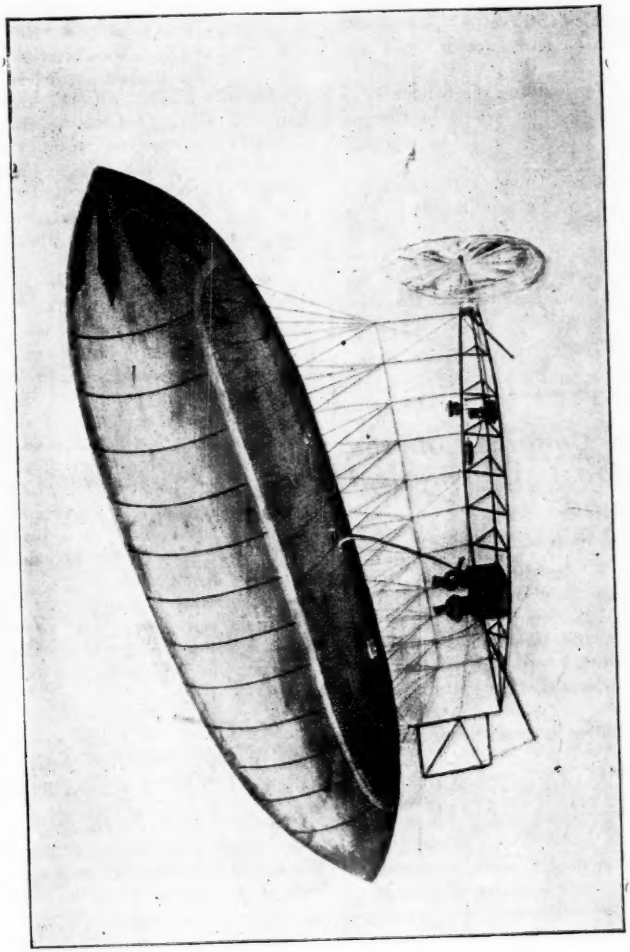
The balloon is constructed of varnished silken fabric, similar to that used for ordinary balloons. Its capacity is about 20,000 cubic feet, length 75 feet, maximum diameter 20 feet. It weighs, with netting, 290 lbs.

The bamboo framework which contains the motor, gearing, car, etc., is 42 feet long. It is built with triangular supports, and is rigidly built with steel wire stays. It is swung 10 feet below the balloon, and the motor is 20 feet from the escape valve.

The motor is a Simms Petrol Motor, with water-cooled head, and magneto ignition. It runs at 2,000 revolutions per minute, and turns the propeller at one-tenth the speed.

The propeller is made of light pine wood wrought to the curve as approved by Sir Hiram S. Maxim. It weighs 28 lbs., is 8 feet in length, and the blades are 4 feet wide at the ends.

The mechanism comprises a steel shaft from the clutch, which is attached to the motor, working a steel pinion, which revolves at the full speed of the motor. This works a gun-metal spur-wheel of ten times its diameter, which carries the propeller shaft. Ball bearings are provided throughout. The exhaust from the motor is surrounded with wire gauze on the Davy lamp principle, to avoid danger through the flame coming in contact with any escaping gas. A starting gear on the free wheel principle is provided, and the necessary tanks for water and petrol with copper tubes, radiator, etc. This work has been carried out by Mr. F. J. Baynes, engineer, of Highbury, under the direction of Mr. Spencer.



The Mellin Airship.

The car, for the aëronaut, consists of a platform on bamboo supports surrounded by open network. At the car are concentrated the cords controlling the clutch (which throws the engine and propeller out of gear), the electric switch (by means of which the motor can be stopped), the rudder lines, the balancing trail rope, the blower (for pumping air into the balloon to control its distention and equilibrium), the ballast control cords, and the valve lines.

Hydrogen gas for inflating the balloon is to be made on the spot by means of the gas generating plant supplied by C. G. Spencer and Sons.

The Mellin airship is being exhibited at the Crystal Palace by the Spencer brothers, who may certainly be congratulated on the success of the first experiment, on June 23rd, when the balloon was steered three times round the enclosure. It can no longer be said that the British nation is behindhand in the very latest departures of aëronautics.

The Berlin Congress of the International Aëronautical Commission.

The Congress of the International Aëronautical Commission held at Berlin from May 20-24, under the Presidency of Professor H. Hergesell, was an unqualified success. Amongst the most interesting subjects of discussion which occupied the attention of the scientific aëronauts of various nationalities, was that of ascents to extreme heights.

PROFESSOR CAILLETET'S NEW APPARATUS FOR INHALING OXYGEN.

The discussion on high ascents was opened by a paper by Professor Cailletet (Paris), who introduced his new apparatus for inhaling oxygen, when reaching very great heights. The chief disadvantage in the method of inhaling oxygen generally in use now consists in having to carry the gas to be inhaled in a compressed condition. For this purpose one needs capacious, strong and heavy reservoirs, as with each breath we consume several litres of oxygen. If oxygen is carried in a fluid condition, which has about the same density as fluid water, comparatively speaking, one only needs a small reservoir, which may assume any desired shape. Monsieur Cailletet avails himself of a pear-shaped metal flask with a double set of walls, the space between them being filled with air. The exterior wall has on its surface a bright polish to prevent the oxygen from coming into contact with heat conductors, also to prevent radiation so as to keep it in a fluid condition. By the introduction of air by pressing an ordinary india-rubber ball the fluid oxygen is driven through a narrow metal tube projecting from the flask, into a detachable tubular apparatus of extraordinarily large surface. Inside this apparatus the fluid oxygen evaporates and passes as a gas through the rubber tubes into a large reservoir, made of the same material, expanding easily, and is safeguarded against the dangers of explosion by a strong net, tied to a ring of the basket. From this reservoir the oxygen is transmitted into the rubber tubes of the breathing mask after having been mixed with ordinary atmospheric air, by means of tubes adapted to the main tubes in sharp angles. The mask is kept before the face by elastic bands, so that the inmate of the balloon is forced to inhale continuously an air which is rich in oxygen. Monsieur Cailletet thinks this to be of great importance. At the lower end of the mask there is a waste air pipe leading out the exhaled air. It is ingeniously provided with a safety-valve of simple construction, and arranged so as to close by itself when aspirating. To prevent the exhaled vapour on condensing from freezing, and to keep the waste air pipe in working order, the latter must be kept under the coat.

THE RECENT HIGH BALLOON ASCENT OF DR. SÜRING AND DR. BERSON.

Dr. Süring next treated of his ascension on July the 31st, 1901, which he undertook in company of Dr. Berson, when the height of 10,800 m. was reached; claimed by them to be the extreme limit yet reached by the aëronaut. The adventure and the scientific results obtained during this expedition having been already fully dealt with, the speaker said he would dispense with dealing with this side of the question. On the other hand, it might prove to be helpful to speak on some points of general interest concerning ascents to extreme heights. The experience gained in the aforesaid expedition may be of service in

future undertakings of a similar character. It is to be hoped that in the future the experts will attach greater importance to these ascents, and that these undertakings will occupy a larger space in their programme than has hitherto been the case. As to the physiological side of the question we may, on closely studying foreign and German ascents, distinguish three stages. During the first of these stages the excitement exceeds considerably the phenomena of height-sickness proper, resulting from want of oxygen. In such a state of excitement, one does not know, perhaps, the real state of the height-sickness, and this naturally becomes an exceedingly critical matter when the dangers of a mishap become imminent. The regrettable issue of the "Zenith" expedition in the year 1874, is no doubt to be traced to this, to a large extent, at any rate; for it is by no means a mere chance that Gaston Tissandier, the experienced and therefore cool aëronaut, survived, whilst his companions Groce, Spinelli and Sivel fell victims. In the conduct of the latter throwing, senselessly, ballast after ballast overboard, so thus sailing helplessly, nay, unconsciously, towards their speedy ruin, we can distinguish the second, more dangerous stage, that of confusion. By systematically inhaling oxygen, this state of excitement leading to confusion and imminently dangerous conduct can be warded off by aëronauts of ordinarily cool disposition; whereas, it is evident that a state of enervation with signs of relaxation cannot be completely prevented. Notes are illegibly written in the wrong place, the eyes refuse their services, the slightest exertion results in a dangerous weakness, and, finally, the whole organism falls a victim to an inevitable need for sleep. But, also these illnesses may yet be overcome to a certain extent if greater precautions are taken in future ascents, if the aëronaut avoids all exertions, all excitement, sleeps sufficiently, undergoes a still more systematic inhaling of oxygen, begins earlier with it and protects himself sufficiently against cold.

THE PHYSIOLOGY OF ASCENTS.

Dr. von Schrötter was next heard on the "Physiology of Ascents." He had made systematic studies on the influence of great reduction of air on the human organism. The experiments were made in the pneumatic cabinet of a Berlin hospital, in which the pressure could be reduced to 230 mm. mercury. These experiments showed that even in the smallest pressure attainable—the most of the experiments having been made, however, at 260 mm. pressure—the inhalation of oxygen had the effect of invariably bringing back the full bodily and intellectual capacities after a certain time varying according to individual. The pathological phenomena are also individually different. The speaker felt pains as if girded too tightly with a belt, and general symptoms of relaxation, which he explains as follows: According to Dalton's law, the quantity of disolved nitrogen in the blood stands in a certain proportion to the outer pressure of air. If the pressure of air is suddenly diminished, more nitrogen leaves the body than would be possible under normal conditions. The infinitely small bubbles of nitrogen collect in the cells into large bubbles, causing embalite process, which latter disturbs the nourishing of the nervous centres and produces relaxation. Also the hindrance of equalization of air pressure has a most painful effect on certain parts of the body, which do not, however, endanger life directly. No marked influence is shown on the number of red blood corpuscles greatly reducing the air, provided this is only momentary.

ORNITHOLOGICAL OBSERVATIONS FROM BALLOONS.

The Chief Lieutenant von Lucanus (2 Regiment of G. Uhlans) made some interesting remarks on ornithological observations from balloons. The Inquiry, which the commandants of the Prussian and Bavarian Aëronaut Division, and the President of the International Commission had made at the instigation of the speaker, had resulted in the assumption that 401 m. was the limit to which birds rise above the surface of the earth, and that there was, therefore, no ground for the assertion of a well-known zoologist that there were birds raising themselves 8,000 m. above the surface of the earth. The lowest limits of the clouds seem to be the highest of birds' flight. More comprehensive observations are yet necessary, especially in countries where many birds of passage cross, as, for example, in Italy.

THE MEASUREMENT OF ELECTRICITY IN THE AIR FROM BALLOONS.

Professor Ebert, of Munich, spoke on "Measuring the density of electricity" from the balloon. Quite lately it was found that the air possessed certain compositions charged

with electricity. They are called electrons, and answer to the description of the solution products obtained in the process of electrolysis. The proof that such electrons exist can be had by the dispersing apparatus on the principle of Professor Elster, and of Geitel. It will be of great importance for physical geography to solve the question as to right proportion of density of positive and negative electrons in the air, according to the various heights. But the Professor had also some objections to make against the apparatus in question. He had succeeded in making the necessary alteration whereby errors he had referred to could be avoided. By means of an aspirator, a certain defined quantity of air could always be conducted past the dispersing body. This resulted in a second advantage; namely, the absolutely accurate measuring of the quantity of free electricity contained in a cubic metre of air.

In the course of the discussion, Professor Elster, of Wolfenbüttel, pointed out the fact that doubts of the actual presence of electrons were still prevailing in some individual circles. Through information obtained from the so-called "Jonenfang" expedition, these doubts are dispelled. Professor Ebert himself had always found the theory confirmed in his experiments, however much he varied them. Dr. Caspari, of Berlin, has discovered and imparts to us interesting connections between density of electrons in the air and height-sickness. He had made these discoveries while on a physiological tour in the high Alps. It appears that it is not the absolute quantity of electrons which causes these physiological influences, but the proportionate superabundance of the electrons. Geheimrath von Bezald pointed out that the relations between sirocco and density of electrons are being studied at his suggestion by Professor Germak, of Tunsbruck. The air descending from great heights when the sirocco blows, carries with it these electrons in large quantities into the lower layers of air. It is thought to be most probable that relations exist between height-sickness and the well-known injurious effects of the "sirocco" wind on the organism of men and animals.

Dr. Linke, of Potsdam, is then called upon. He is the well-known companion of Captain Siegsfeld, and accompanied him on the latter's fatal journey. Dr. Linke reported on the measuring of electricity in the air whilst in the balloon.

On suggestion of Professor Bornstein, of Berlin, and later of the Royal Prussian Meteorological Institute, Dr. Linke had carried through a large series of ascensions to about 6,000 m., and had studied on the one hand the potentials, and on the other the electric conductivity of the air. He had obtained confirmation of former results; namely, that the electric potential of air always showed positive value, but always slower, the higher one ascended. Of a mechanical interest may be the fact that the vertical motions of the balloon give rise to errors in the measurements of the electrometers, which can only be avoided partially. If the balloon is ascending or has only just stopped, one finds quite different despersing values, which leads us to suppose that the balloon must itself have something to do in the matter. The speaker warned against entrusting these difficult measurements of despersion to inexperienced observers.

THE BALLON-SONDES EXPERIMENTS.

In connection with the ballon-sondes experiments, there was a paper by Mr. Eric Stuart Bruce, the Honorary Secretary of the Aëronautical Society of Great Britain, on the Metroparachute, which he has designed to increase the usefulness of the ballon-sondes. As this instrument has been fully described and illustrated before a meeting of the Aëronautical Society, and the proceedings published in the July number of this journal, 1891, it will not be necessary to make any further reference to the invention.

Regarding the monthly ascents of the ballon-sondes, Professor Hergesell stated that it had been resolved that the ascent of at least one balloon at each respective place, was to be made an hour before sunrise, so as to prevent any inaccuracy in the registrating apparatus through radiation, and so that the balloon can be seen when alighting. In these ascents the Teisserenc de Bort Thermograph would be used.

THE HARGRAVE FLYING MACHINE.

On May 10, the members of the Engineering Association of New South Wales viewed the flying machine that is being made at Woollahra Point, Sydney. On this occasion

Mr. L. Hargrave said: The presumption to-day is that all engineers have read about the experiments made by Maxim, Langley, Chanute, Walker, Wright, Pilcher, Lilienthal, Kress, Phillips, and others; and have so far assimilated the matter that it is now common knowledge that power-driven machines will glide through the air supported by surfaces of metal, wood, and fabric. The reason that no machine has yet made a flight of any length that might be called successful is that the relations of weight, power and area have not been rightly combined. Nature shows an infinitude of combinations, and it is safe to say the variety of hand-made machines will be equally diverse. The machine before you may not be one of the successful fliers, but it is hoped that it will push the art a stage further forward.

The first thing to provide for is safety It is worse than useless to take *any* risks. A man may spend years in getting to the trial stage, and then break his neck by being too adventurous. The method of procedure in this case is to float the machine on water, drive the engine for all it is worth, put the horizontal rudder in the lifting position, and it either flies or it does not. If it does rise from the water, two things have to be attended to; the steering up and down and from side to side; the up and down needs the most care; the steering in azimuth is to be solely effected by the movement of the principal weight, and it is further complicated by the listing due to there being only one screw, but direction is unimportant, as, off this point (Woollahra Point), there is a clear track on most courses.

I will now give dimensions of the various parts:—

Main float is 25 feet 7¼ inches long, 10 inches diameter under the boiler, and tapers to 4 inches at the tail and 6¾ inches near the bow. It weighs 25 lbs.

The balance is kept whilst afloat by two outriggers, they are each 5 ft. 6 ins. long, and 6¼ ins. diameter, displacing about 60 lbs. each. The width outside the outriggers is 7 ft. 6 ins., the two outriggers weigh 5 lbs.

The framing consists of 2-inch tin tubes.

Boiler consists of 191.35 feet of copper pipe; it is arranged in a 4 stranded plain coil 10¾ inches diameter. The bore of the pipe is ·27 inch, and thickness of metal ½ mill. The whole of it has been turned down from stock Sydney sizes. There are 13.5 square feet of heating surface. The safety valve is on the water end of the boiler and the steam pipe is ½-inch. The coil and mountings weigh 13½ pounds; and a sheet of asbestos card forms the casing.

Fire, is a sort of "Primus" lamp.

Fuel, kerosene.

Engine, is a 2 cylinder Whitehead, 3½ inches diameter and 3¾ inches stroke cut off at .7 by 1¼-inch piston valves driven by one eccentric. Shaft is 1 inch.

Feed pump, same stroke as engine, .52-inch ram; stroke can be regulated and pump worked by hand to start the engine.

Screw, made of clear pine of the Mangin-Walker-Hargrave type, 6 feet diameter, with provision for altering pitch, diameter, and area. Pitch angle for first trial is 30°. Total area of 4 blades is 6¼ square feet. Boss of screw is aluminium. The wood is sewn together saddler fashion. Weight of 4 blades is 5½ pounds.

Rudder, horizontal, 5 feet by 1 foot right forward.

Lifting surface, 50 yards of muslin 38 inches wide weighing 9½ pounds, arranged in two 3-decked cells, say 470 sq. ft. surface.

The total weights at present are:—

Engine, boiler, floats, framing, screw, &c.	94	pounds.
Water	55	,,
Kerosene	3½	,,
Muslin	9½	,,
Self	162	,,
Total	324	pounds.

leaving 147 pounds available for booms and rigging for muslin and rudder, before the load on each square foot is one pound.

Mr. Hector Kidd, the President of the Engineering Association, wished Mr. Hargrave success on behalf of those present.

NOTES.

New Aëronautical Instruments.—At the recent Aëronautical Congress at Berlin, some new instruments of great promise for aërial research were exhibited. Amongst these was the gyrometer, of Herr Gradenwitz. This apparatus gives, at a glance, the direct speed of the wind in metres and per second without having simultaneously to look at the watch. The apparatus has, at its axle, a cylindrical glass vessel, closed up and half filled with glycerine, to the exterior of which is adapted a ring-shaped scale and ordinary wind gauge. When the apparatus revolves, the sur-

face of the rotating fluid assumes the shape of a rotary paraboloid, which sinks in depth according to the speed of the revolution.

Professor Ebert exhibited an apparatus for the measurement of horizontal intensity of the earth's magnetism from the balloon. It is an improvement on Heydweiler's apparatus, and enables the observer to notify the changes in the intensity without the knowledge of the direction of the astronomical and magnetic meridian. This apparatus is of extreme sensitiveness, and promises to be of the highest scientific value.

The Variation of Temperature with Height.—In an excellent article on scientific ballooning appearing in "Nature" in January last, Mr. N. Shaw discusses the question of the variation of temperature with height. Speaking of the scientific use of the balloon, he says, the primary meteorological question to be determined by balloon ascents is the rate of variation of temperature with height. It was thought that Mr. Glaisher had settled the point, but the subject has been re-opened in Berlin, which is now the centre of scientific ballooning, on the ground that the thermometers used by Mr. Glaisher were not sufficiently ventilated or screened from radiation. In Dr. Berson's investigations, M. Assman's ventilating thermometers were used, and care was taken to make the circumstances of ascent comparable with those of Mr. Glaisher's memorable ascent of 1862. As Mr. Shaw points out, the precautions were carried so far as making an ascent from the Crystal Palace itself on September 18th, 1898, while a simultaneous ascent was made at Berlin to make sure that the differences of the observations were not due to climatic differences between the air over Germany and over England. Further trial was made by the reproduction of Mr. Glaisher's arrangements from his description, and the comparison of its readings with the Berlin arrangements. As the result of the observations, Dr. Berson concluded that the difference of the observations was due to instrumental errors in Mr. Glaisher's observations. Mr. Glaisher's observations led to the conclusion that a constant temperature is indicated at no very great height, whereas Dr. Berson's figures show increasing rate of fall with height. "The difference in the results is one of fundamental importance. Berson's numbers clearly do not go to the end of the matter, for, with a little play of the imagination in the region of Extrapolation his results bring absolute zero within sight of the very moderate height of some thirty miles, whereas 68° C. is the lowest temperature recorded in the flight of the unmanned balloon, Cirrus, from Berlin, which is reported to have reached a height of 18,000 metres. This, by a curious coincidence, is identical with the lowest temperature recorded at the earth's surface. It was registered at Werchojansk, in Siberia, on January 15th, 1885; a still lower temperature—70° C. is given in the Meteorologische Zeitschrift for June, as registered by the apparatus of an unmanned balloon started from Vienna on January 10th of last year."

The Application of Balloons and Kites to Wireless Telegraphy.—Mr. Marconi, in his recent lecture on wireless telegraphy at the Royal Institution mentioned that his late endeavours to utilize balloons and kites for long distance transmission of signals had been unsuccessful, owing to the wind force experienced at the elevation of the balloon or kite. He further condemned the use of aërial methods in a short interview with the Honorary Secretary of the Aëronautical Society after the lecture. But it should be pointed out that the resourcefulness of a Baden-Powell appears to have accomplished what even the illustrious applier of wireless telegraphy has failed to bring about, and to have made his kites of undoubted usefulness in conveying wireless telegraphic messages to moderate distances. Possibly in its present stage of development balloons and kites may not be of use in transmitting messages across the Atlantic, owing to the detrimental effect of wind on the etherial waves. But this fact does not quickly dispose of the whole question as to the use of kites and balloons in connection with the Marconi system. For military purposes, where portability is of consequence, the kite as a means of raising the Marconi apparatus has been proved to be of service in the experiments of the President of the Aëronautical Society to which allusion has already been made. At any rate, Mr. Marconi's confessions display the weaker side of wireless telegraphy, which will have to become independent of the wind if it has to enter the lists in competition with wire telegraphy. The weaknesses of telegraphy through space are certainly, at present, sufficient to justify the military authorities in retaining the old resources of visual signalling.

The St. Louis Airship Competition.—It is officially announced that the St. Louis Exhibition has been postponed to

1904. At a meeting of the aërial committee in April last, it was decided that the course should take the form of the figure 8. The grand stand is to be located near the intersection of the lines. The starting point will be at one of the loops, and after the entire outline of the figure is traced, the finish will be made as stated, near the connecting points of the loops, in view of the spectators. Another point decided was that in the contest only one airship will be started at a time. The race will thus be against time rather than against another craft. The Committee also discussed the sum which is to be reserved for subsidiary prizes in addition to the $100,000 grand prize. The sum of $50,000 is to be divided into ten or twelve parts, each contingent upon the performance of some accomplishment on the part of an air vehicle. For instance, prizes will be offered for various evolutions of airships, upward, downward, backward and forward, circular or angular movements. It appears, however, that the aërial committee have forgotten the most important condition in an airship competition, which is the wind force. It is obvious that the only way in which fairness can be given to such a competition is to award the prize to the competitor who overcomes a certain wind force. Without such a condition there can be no true competition. In the interests of aëronautical science it is to be hoped that the committee will reconsider their decision.

The Sheffield Fatal Parachute Accident.—Few persons can approve of the practice of dropping girls from balloons by means of parachutes to add to the sensation of a professional balloon ascent. The most recent victim to such an undesirable performance was the unfortunate girl who lost her life at Sheffield on May 20th, in falling from a balloon with a parachute which did not open. The opinion of the jury at the inquest in condemning such performances, will be generally endorsed. Perhaps, however, it is a pity that the jury did not add that the accident was an instance of the abuse of the invention of Leonardo da Vinci, and that the legitimate use of the parachute is for saving life in an emergency. The principle of the parachute, depending on the resistance of air, is, in fact, the only lifebuoy of the balloon. In the past it has been the means of saving life. As early as 1803 a case of its usefulness was recorded. Jordarki Kuparenti, a Polish aëronaut, ascended from Warsaw in a fire balloon. When the balloon attained a great height it caught fire, and certain death must have been the aëronaut's fate, had he not been provided with a parachute, with which he made his descent from the terrible situation in perfect safety.

The Collapse of the No. VI. Santos Dumont Balloon.—No one can deny that the No. VI. balloon did M. Santos Dumont good service. It formed the aërial chariot on which the bold Brazilian rounded the Eiffel Tower and won the Deutsch prize. The many evolutions which it accomplished last year in the Parisian capital exposed it to considerable wear and tear, but since the more palmy moments of the Brazilian aëronaut, it underwent a ducking in the Mediterranean Sea, not calculated to improve its condition. Since that episode, it has been on exhibition, blown out with air, inside the Crystal Palace, under conditions that would be trying to the varnished surface of any balloon. It was not a matter of surprise to experts to hear that on examination shortly before the advertised trips of M. Santos Dumont, the balloon was found to be hors de combat. Unkind rumours were at first current that the holes and tears was the malicious work of an adversary. Expert opinion, however, soon disipated such imputations. The very fact of hanging a balloon filled with air in the great glass house, where it was exposed to a heated atmosphere, was not calculated to prolong its life. The writer, some years ago, had a small balloon suspended for exhibition purposes in one of the Courts of the Crystal Palace. One day, after a few weeks' exposure, when it was being blown out with air, it fell to pieces. The collapse of the Santos Dumont balloon is, therefore, not without precedent.

Foreign Aëronautical Periodicals.

(In this list a selection of some of the more notable articles is given)

L'AÉRONAUTE (Paris).

January, 1902.—Rapport du Voyage de M. Turbiaux, Aéronaute du Ballon "La Poste de Paris," *Janvier*, 1871.

February.—Hélicoptère Ballé.

May. — Projet de dirigeable de M. Le Docteur Mora.

L'AÉROPHILE (Paris).

January. — Portraits d'Aéronautes Contemporains: L'Ingénieur Forlanini (G. L. Pesce); Expérience d'Aéronautique sur le Méditerranéen (H. de la Vauix).

February. — Portraits d'Aéronautes Contemporains: Georges Bans (Emile Straus); "Le Voyage du Méditerranéen" (H. de la Vauix).

March. — Portrait d'Aéronautes Contemporains: GeorgeMangin(Henry deGraffigney); "Le Voyage du Méditerranéen" (Henry de la Vauix).

May.—"La Catastrophe du Pax."

ILLUSTRIRTEAËRONAUTISCHEMITTHEILUNGEN.

January, 1902.—Santos Dumont (H. W. L. Möedebeck); Die Verwendung des Luftballons in China Wahrend des Krieges, 1900-1901 (Hauptmann Neumann); Das Zeppelin 'sche Luftfahrzeug (Hugo Kübler); Die Elektrische Ladung das Luftballons (Dr. Franz Linke).

April.—Rudolf, Max, Wilhelm, Hans das Bartsch von Sigsfeld (V. Kleist); Vortrag des Dr. Linke uber seine Fahrt mit Hauptmann V. Sigsfeld nach Antwerpen—Les Ascensions de M. Santos-Dumont (G. Espitalier); Bildung und Konstitution der Wolken (Prof. W. Trabert); Wiener Luftschiffer—Zeitung—(Vienna).

March, 1902. — Flugmaschinen mit und ohne Ballon—Die Erste Luftballon fahrt in England.

April.—Grundgüge Der Praktischen Luftschiffahrt (Victor Silbaer); Der Kriegsballon in Südafrika.

May.—Der Kraftersatz in Mechanischen Princip Des Fluges (Carl Battenstedt).

June.—Der Congress in Berlin—Gar Catastrophe des "Pax."

Notable Articles.

January, 1902.

15. *Daily Mail.*—"Shall we Fly?"
17. *Engineer.*—"Travel in Air."
28. *Daily News.*—"Microbes in Upper Air."
31. *Engineer.*—"Travel in Air."

Feb. 1. *United Service Gazette.* — "Military Ballooning."
3. *Newcastle Chronicle.* — "Aërial Navigation."
4. *Daily News.*—"Balloon in a Gale."
7. *Engineer.*—"Travel in Air."
11. *Daily Mail.*—"The Pioneer of Balloons in Polar Research."
14. *Engineer.*—"Travel in Air."
20. *Westminster Gazette.* — "The use of Balloons in War. Why not under Aërcnautical Research?"
21. *Engineer.*—"Travel in Air."
21. *Times.*—"The Wreck of Santos Dumont No. VI."
28. *Engineer.*—"Travel in Air."

Mar. — *Fielden's Magazine.* — "Recent Aeronautic Experiments."
7. *Engineer.*—"Travel in Air."
— *Engineering.*—"Santos Dumont Airship and Andree Balloon."
21. *Engineer.*—"Travel in Air."
25. *Daily Mail.*—Across Arabia by Balloon."
28. *British Journal of Photography*—"Kite Photography."

Apl. 10. *Nature.* — "The Exploration of the Atmosphere at Sea by means of Kites."
18. *Engineer.*—Travel in Air."
— *Standard.* — "A Scientific Balloon Voyage."

May 2. *Engineer.*—"The Problem of Flight."
13. *The New York Herald.*—"The Fatal Accident to M. Severo."
21. *Sheffield Telegraph.*—"Fatal Parachute Accident."
26. *Daily News.*—"The Parachute Disaster Explained."
27. *Daily Chronicle.* — "First British Airship."
— *The Daily Graphic* — "A Scientific Balloon Congress."
29. *Daily Telegraph.*—"M. Santos Dumont's Airship—an unfortunate Accident."

June 7. *Invention.*—"Accident to the Airship."
11. *The Car.*—"The Motor Aerial."

Applications for Patents.

(*Made in April, May and June to 23rd.*, 1902).

The following list of Applications for Patents connected with Aëronautics has been specially Compiled for the AERONAUTICAL JOURNAL by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.

8016. April 5. LEON ROTHSTEIN. **An Air-Ship.**

8681. April 14. THEODORE HAAS. **Improvements in Flying Machines.**

8875. April 16. GEORGE KIRBY. **Improved construction of Flying Apparatus for use on Stages of Theatres and the like.**

9037. April 18. JAMES JENKIN WALES. **An Improvement for an Aerial Machine for Aerial Flight in any direction used.**

9706. April 26. ARTHUR HENRY PHILIP BLUNT **Improved Flying Machine Propeller.**

10267. May 5. JAMES FRASER. **Air-Ships.**

10349. May 5. LA SOCIETE ANONYME POUR LE COMMERCE ET L'INDUSTRIE DU CAOUTCHOUC (Belgium). **A New or Improved Twin Balloon.**

10642. May 9. HERBERT ARTHUR LEVENS. **Improvements in and relating to Aeronautics and Aerostatics and the like.**

10816. May 10. WALTER ERNEST SYKES. **Improvements in or relating to Flying Machines, Air-Ships, or the like.**

11277. May 16. ARTHUR CHARLES SPENCER. **Improvements in Navigable Balloons.**

11616. May 21. JOSEPH DE LIPKOWSKI. **Improvements relating to Aerial Machines.**

11744. May 23. LARS JARGON ANDERSON. **Twin Balloon Air-Ship.**

11982. May 26. JOSEPH SIEBERL. **Improvements in Flying Machines.**

12222. May 29. ERNEST ARTHUR LE SUEUR. **Improvements in the Art of Aerial Navigation.**

12866. June 5. HORATIO FREDERICK PHILLIPS. **Improvements in or relating to Flying Machines.**

12985. June 7. FREDERICK WARNER JONES. **Improvements in the Construction and Methods of Propulsion of Ships for Water and Air Transit.**

13397. June 13. WILLIAM MACLEOD. **Tractors for Ships and Aerial Machines.**

13499. June 14. ALFRED KARL RUDOLF AUGUST KRAKOW. **Steerable Flying Machine.**